

**BEFORE THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BOARD OF APPEALS AND INTERFERENCES**

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First Named Inventor : Bran FERREN  
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Examiner : Brian J. Broadhead  
Title : MODULAR VEHICLE  
Attorney Docket No. : APPL0031

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January 11, 2008

**MAIL STOP: APPEAL BRIEF - PATENTS**

Honorable Commissioner of Patents & Trademarks  
P.O. Box 1450  
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**BRIEF ON APPEAL**

Applicant's Appeal Brief follows.

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**REAL PARTY IN INTEREST**

The real party in interest is the assignee of the patent application, Applied Minds, Inc., having an address at 1209 Grand Avenue, Glendale, California 91201. Applied Minds, Inc. interest in the application is the subject of a recorded assignment which appears at Reel/Frame: 015273 / 0933.

**RELATED APPEALS AND INTERFERENCES**

None.

### **STATUS OF CLAIMS**

The status of the claims is as follows:

Claims 1, 3-6, 8, 14-16, 18 are rejected. Each of these claims is on appeal.

Claims 2, 7, 9-13 and 17 are cancelled.

### **STATUS OF AMENDMENTS**

Applicant's reply filed May 22, 2007 after final was considered and entered, as stated at item 11 in the Advisory Action, dated June 20, 2007.

## **SUMMARY OF CLAIMED SUBJECT MATTER**

The invention is concerned with the modular vehicle, as set forth in independent Claims 1 and 15 as follows:

1. (Currently Amended) A modular vehicle, comprising:

a vehicle platform (Page 9, lines 29-33; Figures 1; 10; (Page 10, lines 1-7; Figure 2:22; Figure 3:30; Figure 4:40)

a plurality of fixation sites (Page 9; lines 32-33; Figure 1:11) along said platform, said fixation sites comprising standardized interconnection means for any of mechanical, electrical, and fluid connection to specialized functional modules (Page 9; lines 5-7);

said fixation sites being located along said platform at intervals to readily accept at least two said modules simultaneously (Page 8, lines 14-17), where

each said module is sized as a standardized fraction of the total area of said platform (Page 8, lines 14-17), with

said platform providing an underlying foundation for accepting a plurality of combinations of said modules (Page 6, lines 10-12; Page 10, lines 9-13), with

the total area of the modules of said combination totaling no more than the area of said platform (Page 8, lines 19-22);

a control and communications protocol communicatively provided throughout said platform for recognizing any of said module's presence, identity, capability, and function, and for configuring said modular vehicle accordingly (Page 3, line 3; Page 4, line 6; Page 5, lines 9-18; Page 9, lines 9-27); and

at least two modules (Page 7, lines 28 – Page 8, line 32; Figure 6:22, 30, 40) each module providing a unique function, each module comprising a standardized fraction of the total area of said platform, said modules when affixed to said platform comprising in combination a vehicle suited for a particular use, said modules having in combination an

area totaling no more than the area of said platform, said modules having fixation means that are located along said modules at intervals that coincide with at least a portion of said fixation sites of said platform, said fixation means being engageable with said platform at said fixation sites to secure said modules to said underlying platform .

15. (Previously Presented) A modular vehicle, comprising:

a vehicle platform (Page 9, lines 29-33; Figure 1:10; Page 10, lines 1-7; Figure 2:22; Figure 3:30; Figure 4:40);

means for accepting at least two special purpose, self-identifying modules simultaneously on said vehicle platform in a mix and match fashion to provide said vehicle with a desired functionality for a particular application (Page 8, lines 14-17; Page 6, lines 10-12; Page 10, lines 9-13);

a central control system within said vehicle for communication with, and identification and control of said special purpose modules (Page 3, line 33 – Page 4, line 6; Page 5, 9-10; Page 9, line 9-27), and

a plurality of sites at standardized intervals along said platform that each provide a common connection (Page 9, lines 1-7) for mechanical, electrical, and fluid communication for said modules (Page 9, lines 32-33; Figure 1:11).



### **GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

The following grounds for rejection are to be reviewed on appeal:

1. Whether the subject matter of Claims 1, 3-6, 8, and 14 is unpatentable under 35 U.S.C. 103(a) over Kempen *et al* (USPN 6,421,593) in view of Jacob (USPN 6,547,506).
  
2. Whether Claims 15, 16, and 18 are unpatentable under 35 U.S. C. 103(a) over Kempen *et al* (USPN 6,421,593) in view of Glatzmeier *et al* (USPN 5,785,372).

## ARGUMENTS

Claims 1, 3-6, 8 and 14 stand rejected as obvious and unpatentable in view of the combination of two references. In particular, claims 1-8 are rejected under 35 U.S.C. §103(a) as obvious over U.S. Pat. No. 6,421,593 to Kempen et al (hereinafter, "*Kempen*") in view of U.S. Pat. No. 6,547,506 to Jacob (hereinafter, "*Jacob*").

Claims 15, 16 and 18 stand rejected as obvious and unpatentable over Kempen in view of U.S. Pat. No. 5,785,372 to Glatzmeier et al.

The rejections of claims will be discussed primarily by reference to the independent claims, claim 1 and claim 15, which will be discussed in order.

As will be appreciated, in light of both the recent decision by the United States Supreme Court in the case of *KSR International Co. v. Teleflex, Inc. et al.*, (decided April 30, 2007), and, the recent Memorandum to all Technology Center Directors from Deputy Commissioner for Patent Operations, Ms. Margaret A. Focarino (regarding interim "points" for obviousness determinations), the assessment of non-obviousness has been reaffirmed to rely on the Graham factors, with the test of "teaching, suggestion, or motivation" to combine the prior art to meet the claimed subject matter still providing a helpful insight in determining whether claimed subject matter is non-obvious under 35 U.S.C. §103(a).

The four factual inquiries under *Graham* include:

1. determining scope/contents of the prior art;
2. ascertaining differences between the prior art and claims at issue;
3. resolving level of ordinary skill in the pertinent art; and,
4. evaluating evidence of secondary considerations.

Importantly, the Court noted that the analysis supporting a rejection should be made “explicit” and that it was important to identify an “apparent reason” that would have “prompted” or motivated a person of ordinary skill in the relevant field to combine the prior art elements in the manner claimed (emphasis added).

Applicant contends that its arguments herein support a finding of non-obviousness of all claims, in keeping with the *Graham* factors. In addition, Applicant contends that the Examiner has not explicitly provided evidence of an apparent reason for combining the cited references in the manner claimed. Still further, Applicant contends that, even considering common knowledge at the time of the invention, that the disparity between the cited references would not have led a person with ordinary skill in the art to even remotely consider a combination of the cited references. Moreover, Applicant contends that, even if the references were combined in light of the ostensible common knowledge, a person with ordinary skill in the art could not have combined the references to arrive at the results of the claimed invention. Hence, the combination of references even in view of the common knowledge would not yield “predictable results” equivalent to Applicant’s invention.

In particular, Applicant contends that a person of ordinary skill in the art would not even remotely consider combining the modular control system of Kempen with the rudimentary teachings of Jacob to arrive at the claimed invention.

Additionally, Applicant contends that its arguments provide valuable insight associated with the lack of "teaching, suggestion or motivation" ("TSM") to combine the prior art, which further supports a finding of non-obviousness with regard to the claimed invention.

The TSM test for obviousness has three basic requirements. First, the combination of references must teach all of the claim elements. Secondly, there must be identified some teaching or suggestion to combine the references in the asserted manner. Thirdly, there must be identified some expectation that the asserted combination would be successful. See MPEP § 2143.

Considering the four inquiries of *Graham*, it is respectfully submitted that a prima facie case of obviousness is not presented by the arguments for the rejection of claim 1, particularly as currently amended, for the following reasons:

The scope and content of the prior art cited was insufficient at the time of the invention to prompt a combination of the cited prior art (Kempen and Jacobs) to arrive at the claimed invention; and, the differences in the cited prior art and the claims at issue are significant and sufficient to conclude that there would be no apparent reason to combine the references to arrive at the claimed invention.

The Office Action does not touch on the additional *Graham* factors of **resolving** (emphasis added) the level of ordinary skill in the pertinent art at the time of the invention, nor does it consider or evaluate evidence of secondary considerations.

In addition to the above, considering the inquiry under the TSM test, Applicant contends that the non-obviousness of the claimed invention is reinforced for the reasons that (1) the cited combination of the references does not teach each and every claim element, (2) no objective teaching or motivation to combine the cited references in the asserted manner has been identified, (3) no expectation of success in such a combination has been identified, and moreover, (4) the cited combination of references clearly teach away from the claimed invention. Consequently, Applicant contends there would be no apparent reason to combine the cited references, and, one skilled in the prior art would not have been prompted to combine the references in the manner claimed, and, the combination would not yield results according to the claimed invention.

Following are Applicant's additional specific arguments directed to its overall contentions as stated above.

**Claims Rejection - 35 U.S.C. § 103(a)**  
**(Claim 1)**  
**"Kempen in view of Jacob"**

The Examiner asserts that Kempen teaches the elements of claim 1 of Applicant's invention, particularly by equating a "variant module" of Kempen to the individualized,

combinable, interrelated modules of the claimed invention (see column 3, lines 1 -11). Applicant respectfully traverses Examiner's rejection and asserts that Kempen teaches primarily a modular military vehicle control system comprised of "interface modules" (see column 1, lines 62 -63; column 2, lines 1-17). Kempen, in the spirit of being his own lexicographer, uses the term "module" to loosely refer both to "interface modules" of a control system and purported "variant modules" representing entirely different types of vehicles. The "interface module" of Kempen satisfies a rational definition of "module" where a module is a standardized, often interchangeable component of a system or construction that is designed for easy assembly or flexible use.

Applicant contends it is too great a leap to ascribe this rational definition of "module" to the purported "variant module" of Kempen. The examples of "variant modules" described by Kempen include a fire engine and a tow truck/wrecker (see Figures 1 and 14, respectively), along with a dump truck, water pump truck and telephone truck (see column 39, lines 29-32). Further, Applicant contends that the key modularity associated with these examples would reside in the individual interface modules of the control system.. When comparing the control system of Kempen's fire engine (see Figure 1) with that of Kempen's tow truck (see Figure 14), the clear dissimilarity and lack of modularity is plain to see. A person of ordinary skill in the art would recognize the challenges associated with creating a common chassis and control system to support the distinct differences between the functions of these types of vehicles.

Kempen has been cited as the Examiner's primary and best reference, and based upon this misapplication of the comparison of "modules," Applicant asserts that a case of prima facie obviousness has not been made and, the other references are moot.

Applicant points out additional arguments to support and reinforce a decision by the Board to instruct the Examiner to allow the present claims. First, Kempen clearly teaches a singular, unitary body attached to a vehicle chassis, with power and communication hookups: "**a chassis and a variant module**" (emphasis added; see column 3, lines 2-3; column 26, lines 20-54). In contrast, the Applicant's invention proposes a "mix and match" approach with multiple distinct but integral specialized modules, each with a different function and variable attachment requirements.

Both the control system configuration and the mechanical fixture system to accommodate the attachment of multiple modules of the claimed invention is fundamentally different than what is required for attachment of a single, complete module, as described in Kempen. Since the primary thrust of Kempen's invention is the delivery of modular control systems dependent on various interface components, Kempen's discussion of a modular vehicle arrangement is lacking in its disclosure. For example, with multiple modules of various sizes, a standardization scheme re: attachment or "fixation points" is required so that each module is sized for a fractional extent of the underlying platform. Nothing in Kempen leads one to believe that the attachment points are anything more than the standard attachment points used for attaching any standard truck body to a

chassis. Inasmuch as Kempen relies on these limited attachment points, and singular connectors, he is necessarily also limited to providing unitary systems. One skilled in the art of truck fabrication at the time of the claimed invention would not have been motivated to develop multi-site attachment points as in the claimed invention.

Further, when replacing only one, identically sized module, a single set of connectors suffices, i.e. one set of mechanical attachments, one fluid connector, and one electrical connector (see column 28, line 67, "two mating connectors 1681 and 1682). For Applicant's scheme of multiple functional modules of various sizes and in various combinations, a plurality of connection sites must be furnished on the standard platform, both mechanical attachments and multiple sets of fluid and electrical connectors. The Applicant has described and claimed these aspects.

With further reference to claim 1, and considering Applicant's arguments herein, Examiner's admission that Kempen does not disclose "fixation sites defining fractional locations" (see Office Action, page 2, item 3) further supports Applicant's contention of non-obviousness. In contrast with the claimed invention, Kempen does not teach a plurality of fixation sites, a platform capable of accepting at least two functional modules simultaneously, and functional modules sized as a standardized fraction of the total area of the platform and equipped with fixation means.



The Examiner has also relied on the introduction of Jacob to support a rejection of the claims. Jacob teaches an arrangement of separate, removable containers, i.e., open bins, in the payload area of a multi-task truck. Examiner asserts that the containers of Jacob are equivalent in concept to the fixed, mateable, yet exchangeable functional modules of the claimed invention. Applicant contends there is no equivalence and that Jacob's bins would neither be construed nor relied on by a person of ordinary skill in the art as the "same elements" as the complex, functional modules of the claimed invention, irrespective of how the bins might be arranged on the back of a truck. Jacob's bins are merely boxes that can be filled with parts or material.

Jacob teaches a multi-task truck with a crane and hose reel, whereby containers may be placed in the truck bed by the crane. As detailed in column 2, lines 52-65, these containers simply hold raw materials, such as, in Jacob's example, spare parts, bricks, and sand and cement. The Examiner has described the containers of Jacob as "smaller and plural modules" (see Office Action, page 3, fourth line from end). However, Applicant respectfully asserts that this creates a continuing, lexicographic slippery-slope that suggests the evolution of a simple box may eventually become the equivalent of the specialized, functional modules of the claimed invention. In light of this arguably speculative association, Applicant respectfully traverses Examiner's suggested equivalence between the bins of Jacob and the modules of the claimed invention.

Examiner's present grounds for rejection appear to hinge on the asserted teachings of Jacob. Consequently, it bears repeating that, unlike Applicant's specialized functional modules, Jacob's modules are simply open containers. The containers have no electrical or fluid connections. The containers have no mechanical attachments for rigidly affixing to Jacob's truck. The containers are simply placed into the open truck bed which is subdivided by movable tailgates. The containers have only "eyes" or rings at their corners to enable the crane to hoist them via lifting straps (column 2, lines 53-58). Consequently, Jacob does not teach "fixation sites defining fractional locations along an overall platform extent" since the containers are never mechanically, functionally or otherwise attached to the platform.

Additionally, the Examiner's asserted combination of Kempen in view of Jacob appears to rely on a finding of a common element between the two, which in this case, appears to be a generic "module". As previously described, Applicant contends that the bins of Jacob are not equivalent elements to either the single unitary body of Kempen or Applicant's functional modules. Further, Applicant contends that an allegation that art can be combined has no bearing on whether the artisan would have made the combination; the law requires not just evidence of ability, but also evidence of motivation. See MPEP §2143.01 ("mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.")

Moreover, as discussed above, the mere existence of a common element across references is not a prima facie suggestion to combine those references. Examiner's argument for rejection appears to presume a common element, a "module," exists between the two cited references, perhaps providing an apparent reason to combine, when in fact, no such common element exists.

The combination of Kempen and Jacob thus fails to teach the claimed elements of Applicant's invention, including a platform with a plurality of fixation sites to accommodate at least two functional modules, each of which are sized to standardized fractions of the platform area. Instead, Kempen teaches only modular control systems to support different unitary bodies for attachment to a chassis as one unit. Further, Jacob teaches portable bins arranged on the bed of a truck. Applicant respectfully contends that the Examiner has failed to provide explicit support for an apparent reason to combine the bins of Jacob with the control modules of Kempen to arrive at the claimed invention. In addition, Applicant contends that any such combination, regardless how implausible, would not yield results equivalent to that of the claimed invention. Further, there is no motivation to combine the specialized unitary body of Kempen, which completely and totally changes the character of the vehicle, with either Jacob's removable containers which simply hold different raw materials, or with Jacob's alternative embodiment of affixing numerous components to a skid plate which is then winched onto the truck bed as a whole.

Consequently, for the reasons stated above, Applicant contends that there could be no objective teaching or motivation to combine Kempen in view of Jacob to arrive at the

claimed invention, and thus, no apparent reason to combine, and consequently, the Office Action fails to make a prima facie case of obviousness. Therefore, Applicant respectfully requests that the Board instruct the Examiner allow claim 1 and its dependents, claims 3-6, 8 and 14.

**Claims Rejection - 35 U.S.C. § 103(a)  
(Claim 15)  
“Kempen in view of Glatzmeier”**

The Examiner has rejected claims 15, 16 and 18 as obvious and unpatentable over Kempen in view of U.S. Pat. No. 5,785,372 to Glatzmeier et al (Glatzmeier). Applicant contends that claim 15 in its present form is in proper form for allowance for the reasons associated with remarks above relating to claim 1 and for the additional reasons cited below.

The Examiner relies on the combination of Kempen and Glatzmeier to assert that Applicant's independent claim 15 and dependent claims 16 and 18 should be rejected for obviousness. Applicant respectfully traverses the Examiner's rejections and contends that the proffered combination is inappropriate and would not yield the results of the claimed invention.

Glatzmeier teaches a “self-supporting box structure for a utility vehicle” which “permits a large number of embodiment variants for the equipment cab, **which are then not further altered in operation**” (emphasis added; see column 1, lines 31-35).

Glatzmeier's configuration is merely a permanent structure to support equipment racks, which are not themselves removable. Clearly, this invention is not intended as a modular vehicle in anything like the sense of Applicant's invention, which is designed to be easily modified by users to meet the operational needs of the moment.

Again, Glatzmeier provides a "structural arrangement" for assembly during manufacturing that is "**not further altered in operation**" (emphasis added). In essence, Glatzmeier simply describes a type of architectural arrangement or structural design to produce one version of the single, unitary body of Kempen. Consequently, the basis for combination, i.e., the "apparent reason" cited by the Examiner, is that it would have been obvious "to use the smaller and plural modules of Glatzmeier et al. because such modification would **provide rapid and free assembly of variously fitted equipment cabs** ... due to rapidly changing conditions of use" (emphasis added), (see Office Action, page 5, last third of first paragraph). Applicant contends this is not a correct interpretation of the teaching of Glatzmeier and that Glatzmeier combined with Kempen would not yield the results cited of "rapid and free assembly" due to "changing conditions of use."

There is only one box structure in Glatzmeier, which is plainly not "a plurality of said modules". The box structure contains a number of compartments, which are rigidly assembled to form a unitary body. The point of novelty in Glatzmeier deals with provision of structural integrity, not modularity. There is no evidence these compartments are anything other than unalterable components of the box structure. These compartments cannot be described as "modules" in the sense of the claimed invention.

Again, Glatzmeier simply recites a structural configuration to ease assembly during manufacture. Manufacture is not an operational setting as contemplated by Applicant's invention, and, Kempen cannot be modified in light of Glatzmeier to provide the claimed invention, particularly given the recognition of the individual structural instability of Glatzmeier's compartments.

The Examiner cites and relies on a single paragraph in Glatzmeier, column 1, lines 20-28, as an indication that Glatzmeier was describing "smaller and plural modules". Applicant respectfully points out that the use of this reference is somewhat misdirected due to the teachings of the underlying art. As previously pointed out in earlier office actions, these lines refer not to Glatzmeier's invention but to other prior art (Hawelka & Staudinger, DEC3517290, US4830421, provided as evidence hereto in the Evidence Appendix), which he says describes a number of modules that when combined form a box structure, and that since each module has to be self-supporting, has the disadvantage that "the empty weight of such a box structure is relatively high for a utility vehicle".

As Applicant indicated in previous office actions, Glatzmeier mischaracterized this prior art. The modules cited in Hawelka are independent, cylindrical equipment racks fitted into the body of the vehicle, which can be changed out for other racks. There are no electrical or fluid interconnections to these racks. The attachment mechanism is entirely in the fixed body of the vehicle, attaching to pins or an axle on each module.

In contrast, Applicant claims modules that are not fitted into the body of the vehicle, but that together comprise the body of the vehicle. There is no indication in Hawelka that

the body itself is changeable or modular. Rather, the only teaching in the reference is that equipment racks may be fitted to a body.

There is no apparent motivation to combine the unitary, removable and functional module of Kempen with the fixed, inert structure of Glatzmeier.

### **Counterarguments to Examiner's Response to Arguments**

At page 6, paragraph 10 of the Office Action, the Examiner asserts that Jacob shows the "unique functions provided by the modules" to support the new ground for rejection requiring Kempen in combination with Jacob. However, Applicant contends that Jacob's "modules" as referenced by the Examiner are simply passive, inert containers for holding items and raw materials; they bear no resemblance to the functional modules of Applicant's invention. Therefore, for the other reasons cited earlier, Applicant respectfully maintains that the new ground(s) for rejection based on Jacob are improper, therefore, the rejection is moot and claims 1, 3-6, 8, and 14 are in proper form for allowance.

Further, at page 6, paragraph 11 of the Office Action, The Examiner argues that making Kempen's single module into similar multiple modules requires only routine skill in the art. Applicant respectfully disagrees for the reason that fundamental and nonobvious modifications and invention are necessary for a multiple module scheme, as claimed by the Applicant. First, the modules must be sized in standardized fractions, requiring innovation in the design of each module according to its specific function. Second, a plurality of fixation sites must be furnished to accommodate variously sized modules, as opposed to

only one set of fixation sites to fit all single modules. Third, the modules must remain individually autonomous while retaining structural integrity to allow rapid assembly and dismantling. Fourth, the fact that the references cited by the Examiner reveal there is no prior art cited that teaches multiple functional modules on a platform such as Applicant describes is powerful evidence of the nonobviousness of the claimed invention. Applicant contends that it would, at a minimum, require a high level of skill, not an ordinary level of skill, to arrive at the claimed invention in light of the cited references.



Moreover, at page 7, paragraph 12, the Examiner argues that items 176 and 177 of Glatzmeier are equivalent to a "plurality of fixation sites" as in the claimed invention. However, a close examination of Figure 2 of Glatzmeier reveals that the plurality of "fixation sites" referenced by the Examiner as "items 176 and 177" are not the equivalent of the plurality of standardized fixation sites of the claimed invention to support a plurality of modules. Instead, items 176 in Figure 2, of which there appears to be only two in number, and at most four, are merely the standard attachment points for the cab of a truck. Further, items 177 in Figure 2, of which there appears to be only two and at most four, are merely standard attachment points for attaching any standard body to the chassis of a truck. The fixation sites of Glatzmeier are nothing more than standard attachment points. They do not equate to the plurality of fixation points of the claimed invention, further reinforcing Applicant's contention that the combination of Kempen and Glatzmeier does not yield the claimed invention, and hence, Applicant's invention is not obvious.

Respectfully submitted,



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## CLAIMS APPENDIX

1. A modular vehicle, comprising:

a vehicle platform;

a plurality of fixation sites along said platform, said fixation sites comprising standardized interconnection means for any of mechanical, electrical, and fluid connection to specialized functional modules;

said fixation sites being located along said platform at intervals to readily accept at least two said modules simultaneously, where

each said module is sized as a standardized fraction of the total area of said platform, with

said platform providing an underlying foundation for accepting a plurality of combinations of said modules, with

the total area of the modules of said combination totaling no more than the area of said platform;

a control and communications protocol communicatively provided throughout said platform for recognizing any of said module's presence, identity, capability, and function, and for configuring said modular vehicle accordingly; and

at least two modules, each module providing a unique function, each module comprising a standardized fraction of the total area of said platform, said modules when affixed to said platform comprising in combination a vehicle suited for a particular use, said modules having in combination an area totaling no more than the area of said platform, said modules having fixation means that are located along said modules at intervals that

coincide with at least a portion of said fixation sites of said platform, said fixation means being engageable with said platform at said fixation sites to secure said modules to said underlying platform .

3. The vehicle of Claim 1, further comprising:  
a dedicated path about said platform for effecting individual control of said modules.
4. The vehicle of Claim 1, further comprising:  
a computer implemented vehicle operating system for controlling said modules.
5. The vehicle of Claim 1, said fixation sites comprising:  
a plurality of custom interfaces for any of contact closures, lighting, power, control, and interface to computers on board one or more of said modules.
6. The vehicle of Claim 1, said control and communications protocol further comprising:  
means for recognizing said module's personality.
8. The vehicle of Claim 1, said computer implemented control and communications protocol further comprising:  
means for controlling vehicle operation and configuration, both in accordance with a current vehicle complement of said modules and in accordance with vehicle resources and performance specifications.
14. The vehicle of Claim 1, said computer implemented control and communications protocol further comprising:  
means for acknowledging any said module, and for performing a background calculation for any of said module weight, balance, and power consumption.

15. A modular vehicle, comprising:

a vehicle platform;

means for accepting at least two special purpose, self-identifying modules simultaneously on said vehicle platform in a mix and match fashion to provide said vehicle with a desired functionality for a particular application;

a central control system within said vehicle for communication with, and identification and control of said special purpose modules; and

a plurality of sites at standardized intervals along said platform that each provide a common connection for mechanical, electrical, and fluid communication for said modules.

16. The vehicle of Claim 15, said fixation sites defining fractional locations along an overall platform extent, wherein said platform receives a plurality of said modules, wherein said modules have an extent that is equal to, or that is a fraction of, said platform extent, and wherein any number of modules having a total, combined extent that is less than or equal to the extent of said platform may be attached to said platform at any given time.

18. The vehicle of Claim 15, said central control system further comprising:

means for any of assessing any of said module weight, power consumption, size, and functionality; determining whether a complement of modules fit within design limits of said platform; and dynamically configuring a user interface to express functionality of each of said modules installed on said platform.

**EVIDENCE APPENDIX**

USPN 4,830,421

## [54] SERVICE VEHICLES

[75] Inventors: Walter Hawelka, Linz/Donau;  
Hermann Staudinger, Neuhausen, both  
of Austria

[73] Assignee: Konrad Rosenbauer KG, Leonding,  
Austria

[21] Appl. No.: 112,055

[22] Filed: Oct. 22, 1987

## Related U.S. Application Data

[63] Continuation of Ser. No. 42,592, Apr. 17, 1987, abandoned, Continuation of Ser. No. 733,520, May 13, 1985, abandoned.

## [30] Foreign Application Priority Data

May 18, 1984 [AT] Austria ..... 1645/84

[51] Int. Cl.<sup>4</sup> ..... A62C 27/20

[52] U.S. Cl. .... 296/24.1; 296/37.6;  
296/183; 280/5 D; 312/238; 239/172; 169/24

[58] Field of Search ..... 296/3, 24 R, 37.6, 183,  
296/193-197; 280/4, 5 R, 5 D; 312/202, 238;  
169/24; 239/172

## [56]

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125234	11/1984	European Pat. Off.	169/24
610205	4/1979	Switzerland	169/24

Primary Examiner—Dennis H. Pedder

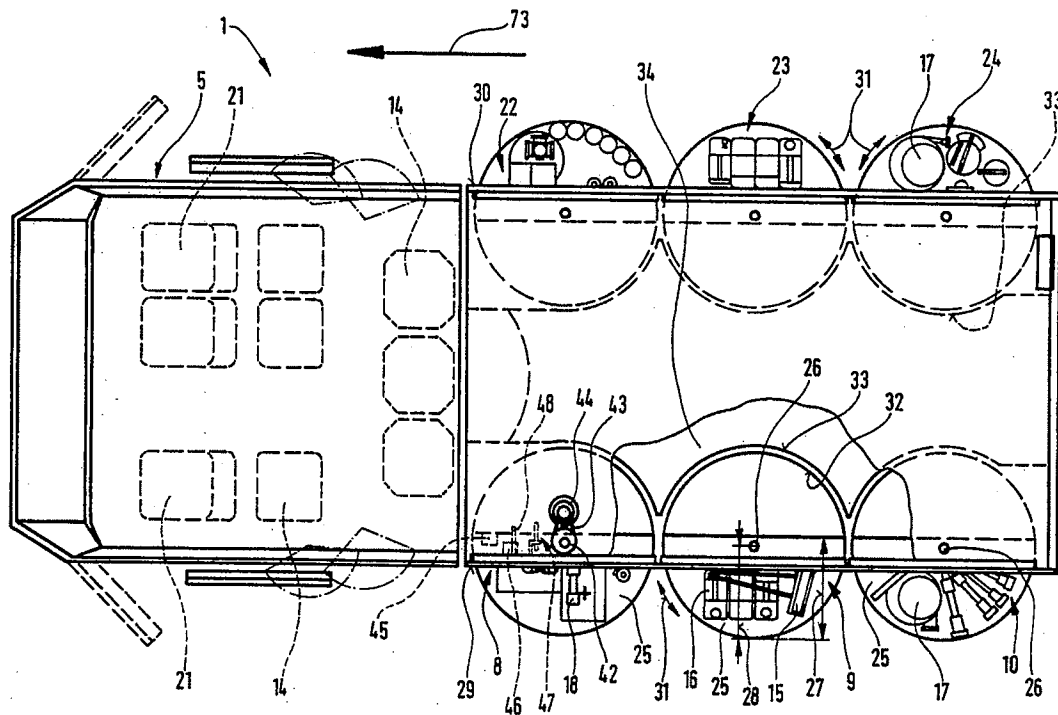
Attorney, Agent, or Firm—Kurt Kelman

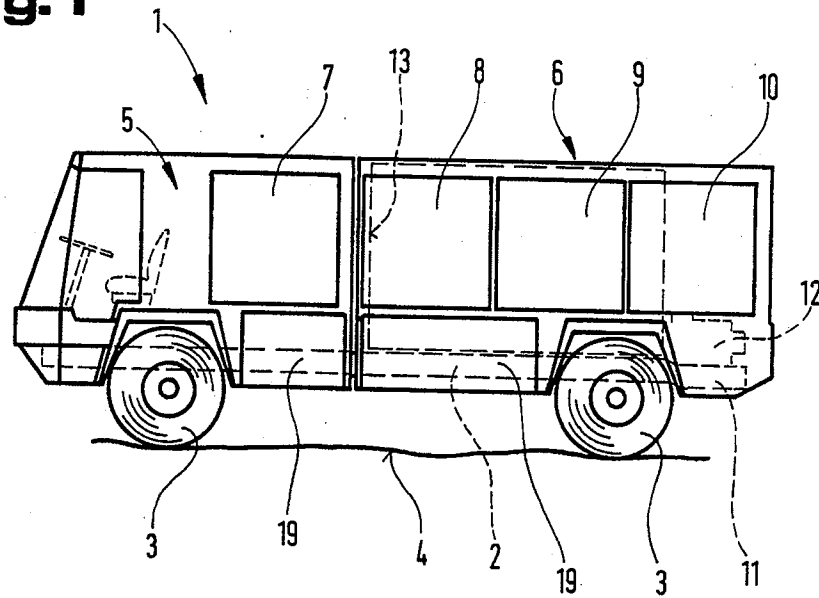
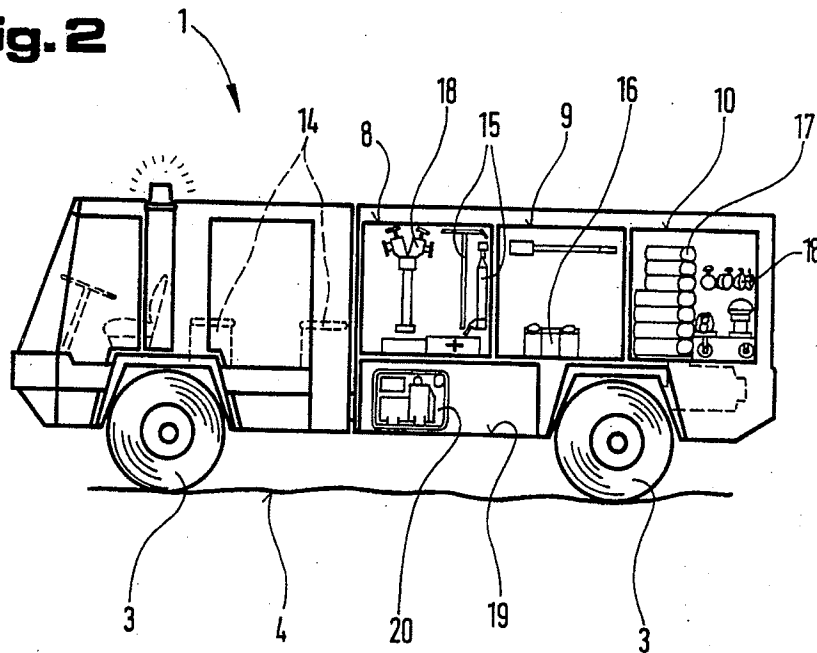
## [57]

## ABSTRACT

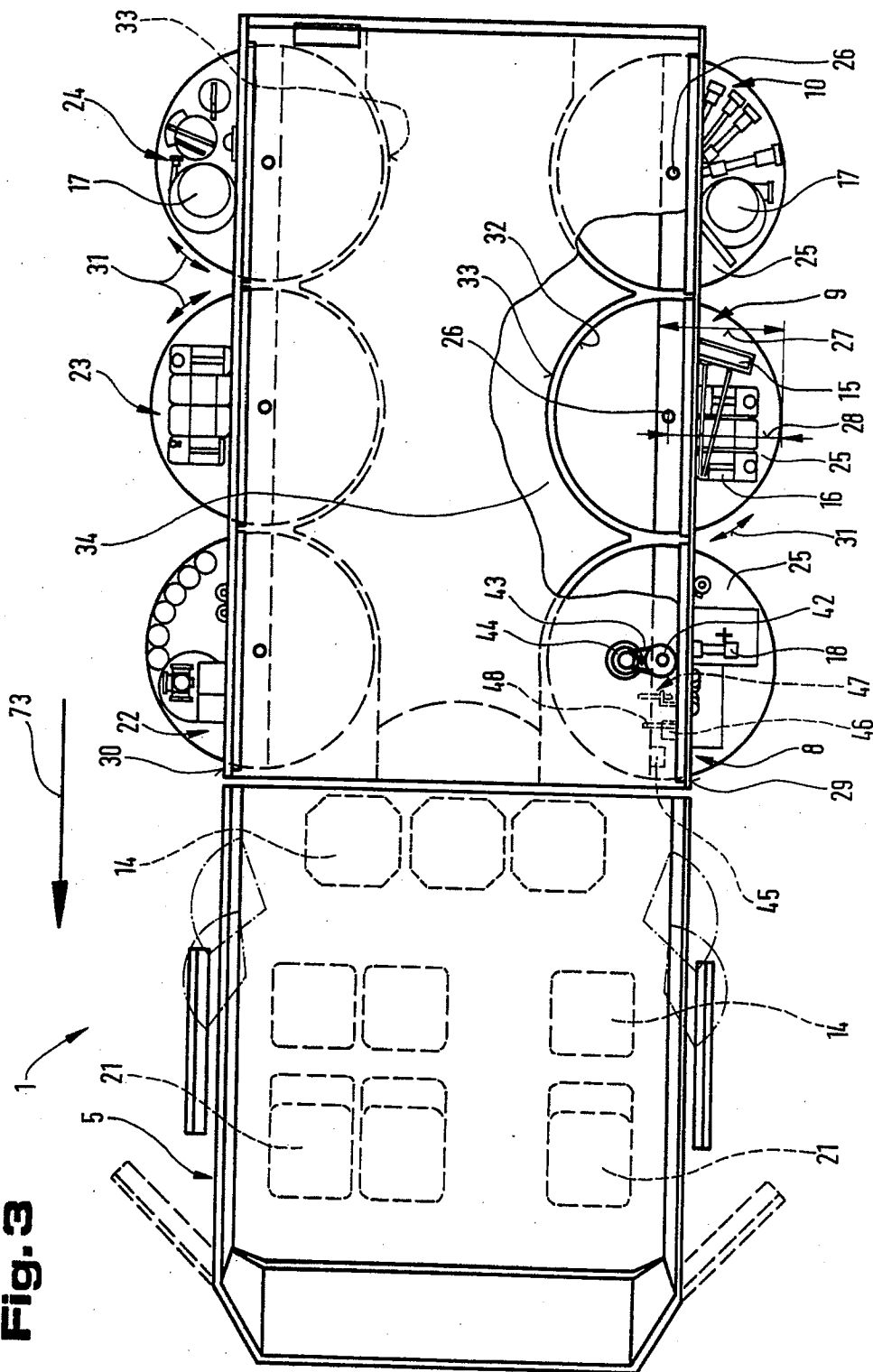
A service vehicle comprises a chassis frame, a driver's cab and two side walls defining an equipment compartment on the chassis frame. The equipment compartment comprises equipment modules mounted in the range of each one of the side walls and holding service equipment, and the equipment modules may be guidingly displaced with respect to the vehicle for ready access thereto.

9 Claims, 7 Drawing Sheets

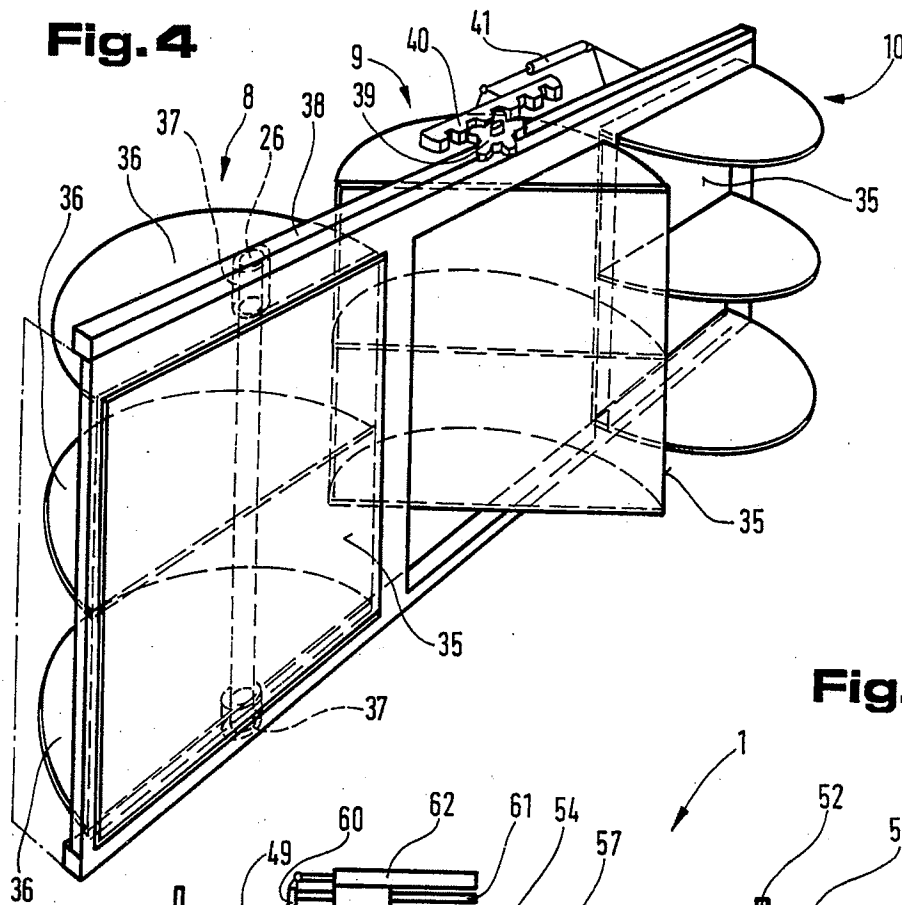
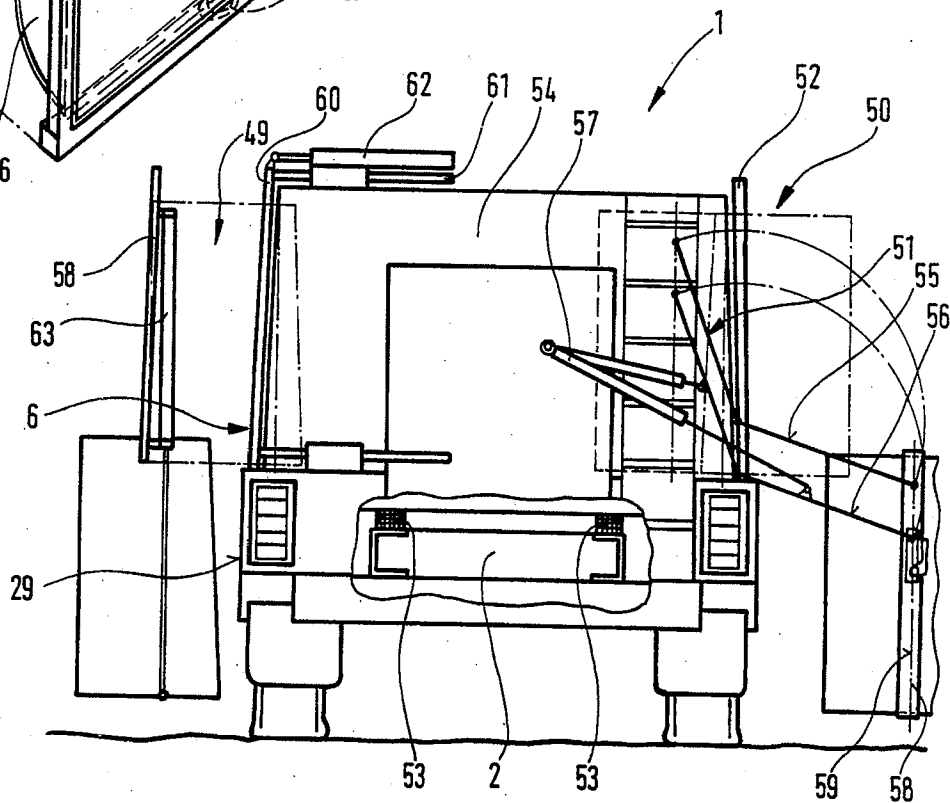


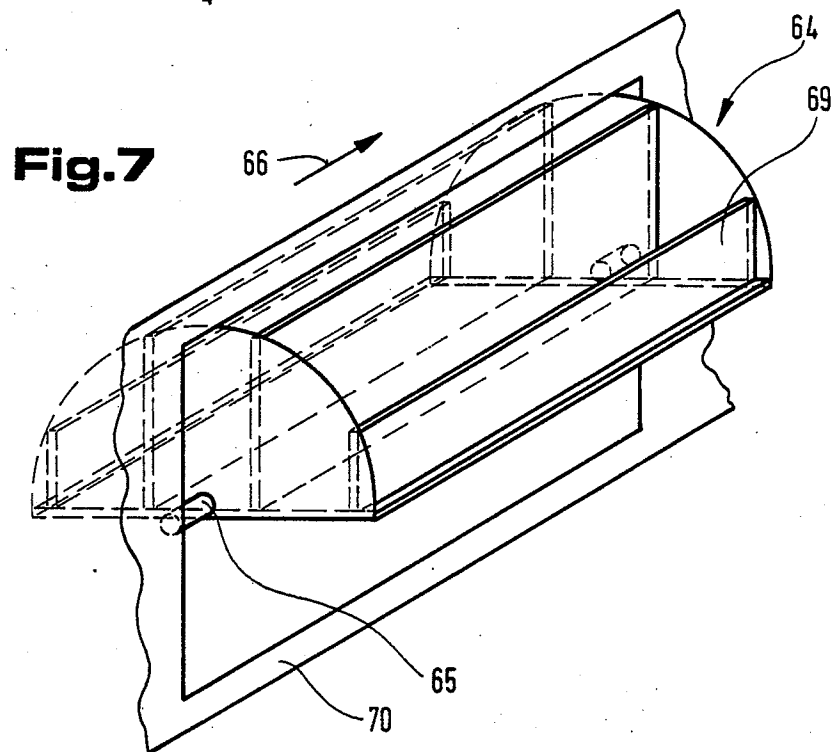
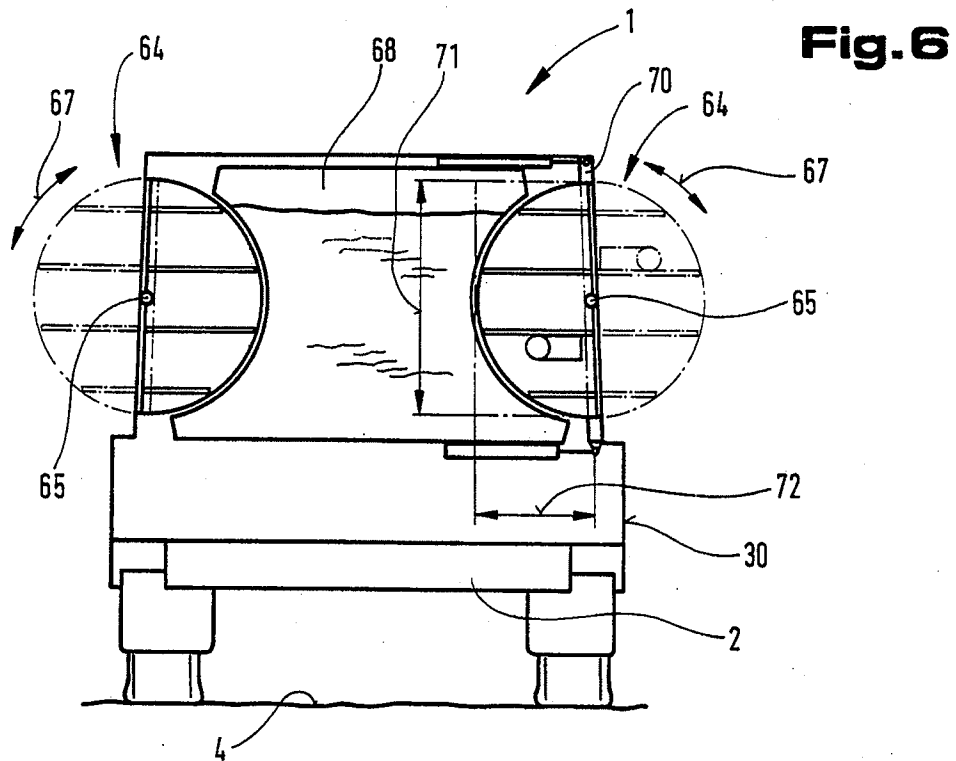
**Fig. 1****Fig. 2**

**Fig. 3**

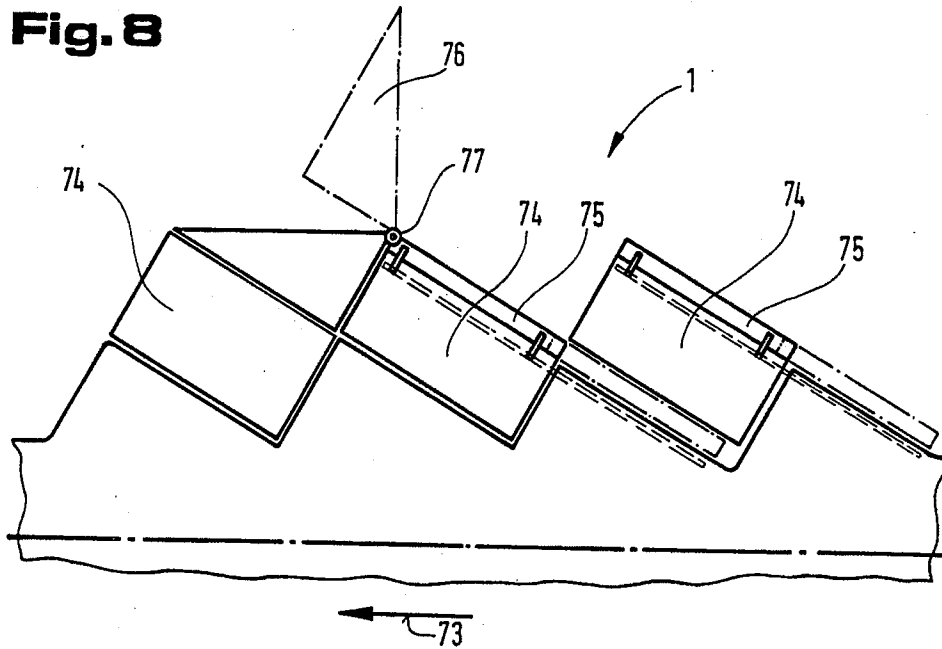




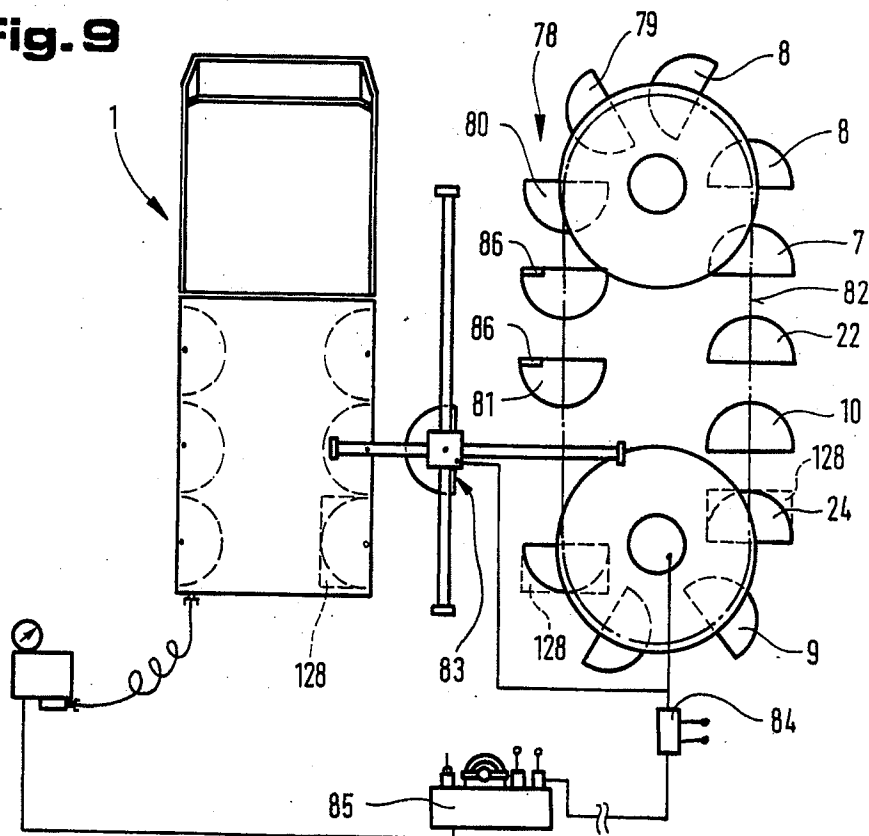
**Fig. 4****Fig. 5**

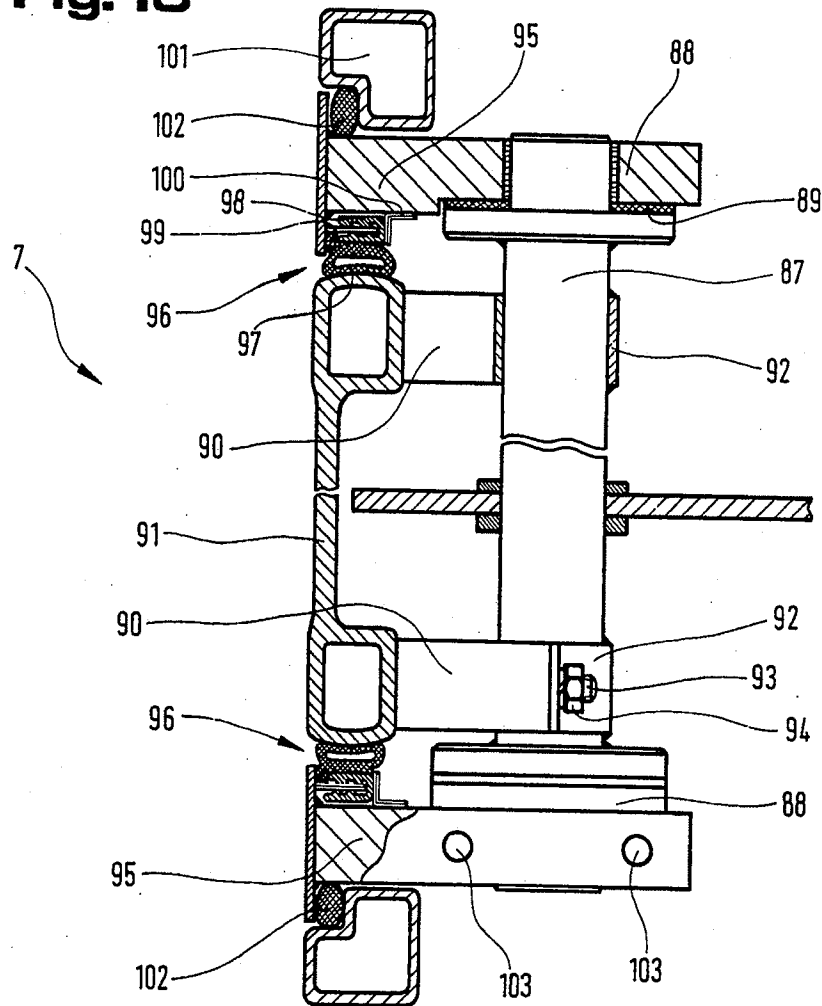
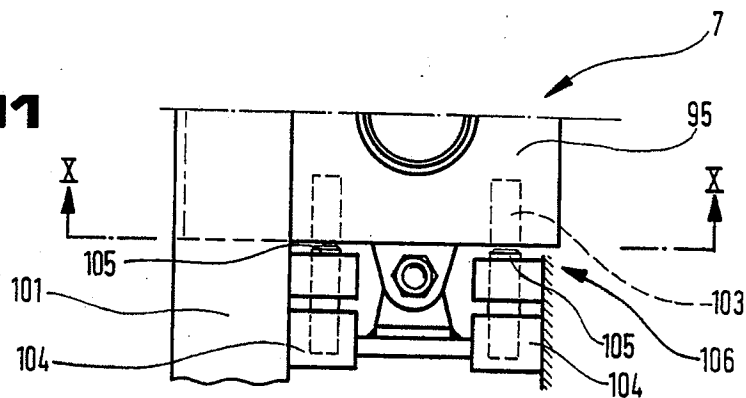


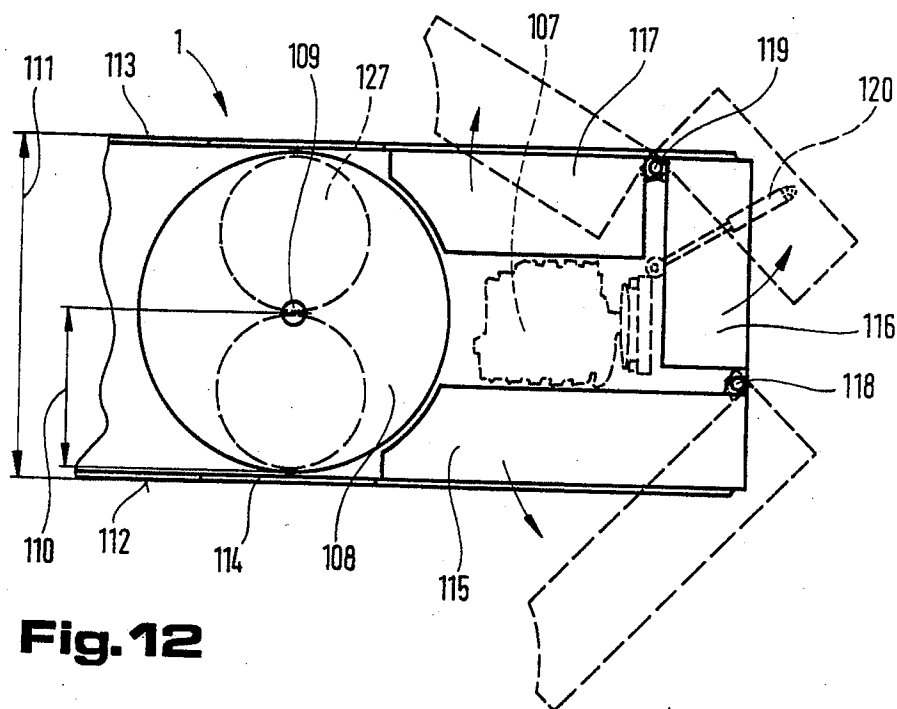
**Fig. 8**



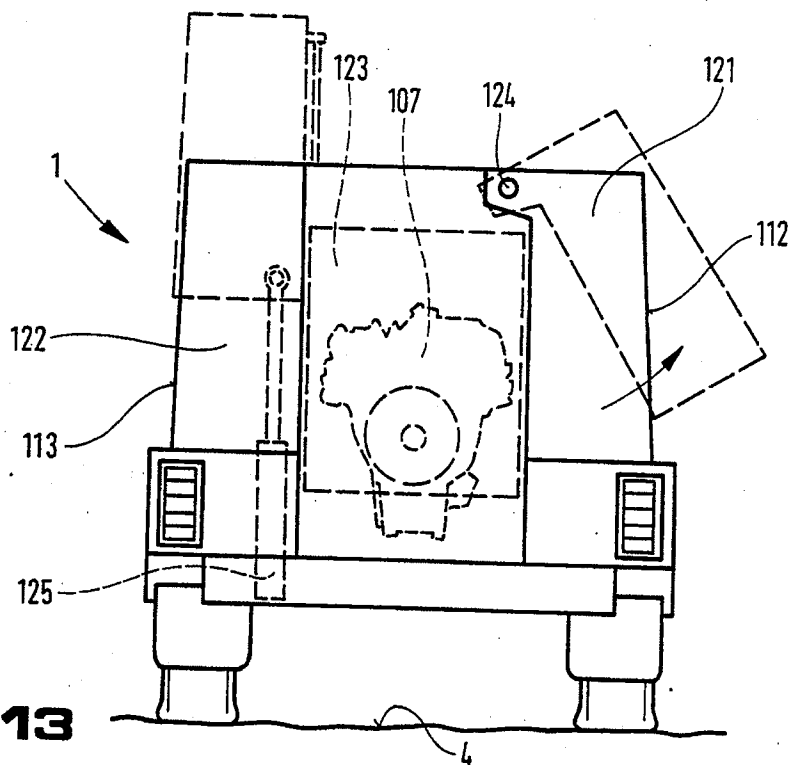
**Fig. 9**



**Fig. 10****Fig. 11**



**Fig. 12**



**Fig. 13**

## SERVICE VEHICLES

## CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation of our copending U.S. application Ser. No. 733,520, filed May 13, 1985, now abandoned and replaced by continuation Ser. No. 42,592, filed Apr. 17, 1987, now abandoned.

## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

The invention relates to a service vehicle, in particular but not exclusively to a fire service vehicle, having a driver's cab and an equipment compartment installed on a chassis frame, the equipment compartment being adapted for reception of implements and/or fire-fighting devices and the like.

## 2. Description of the Prior Art

Service vehicles known at present comprise an equipment cabin which commonly includes shelves and drawers for receiving the different items of equipment. In this connection, it is also known to install some equipment elements, such as fire extinguisher pumps, on pivotable inserted parts so that they may rapidly be moved from the level of the loading area of the service vehicle to the roadway surface. Different vehicles for different kinds of equipment mostly require a different detailed layout of the equipment cabin for each of the service vehicles and this requires a considerable investment.

Standard commercial vehicles, on which appropriate modular equipment holders are installed have also been used as service vehicles. Such vehicles are being produced and sold at present by the assignee of applicants under the name "The Cobra Universal Vehicle". They have also equipped service of fire service vehicles of conventional structure with crane containers to outfit them for special applications, for example the application of oil or foam, forest fires, earthquakes and the like. The containers prepared in this manner are loaded by crane on the vehicle and carried to the site of operation. In the case of sites of operation situated off the road, these containers may also be carried by aircraft, in particular helicopters. These known service vehicles have proved satisfactory but they could not be adapted to varying emergency requirements.

## OBJECTS AND SUMMARY OF THE INVENTION

An object of the invention is to provide a service vehicle and in particular a fire service vehicle which may be provided with a standard superstructure as regards the driver's cab and the equipment compartment, and which may be fitted out rapidly and economically with the items of equipment needed for different requirements.

This problem of the invention is solved with equipment modules for the reception of implements and/or fire extinguishing means, which are displaceable with respect to the vehicle. Standard equipment modules for this purpose may be produced in advance and provided with different items of equipment, depending on the purpose of application. Such equipment modules may thus be prefabricated and fitted out quite independently of the manufacture of the service vehicles. Upon ordering the vehicle, the customer may select the modules appropriate to this vehicle from the available equipment

modules. These may also be simply exchanged at any time and replaced by an equipment module of a different series, if the vehicle is subsequently to receive complementary equipment or to be re-equipped. As a result, constructional work required to provide different vehicles is reduced and the service vehicles have an approximately identical fundamental structure.

According to one feature of the invention, the equipment module may comprise a cylindrical casing having a circular cross-section and a longitudinal axis arranged at right angles to the wheel support plane of the service vehicle as a pivot shaft. The pivot shaft may be installed in a bearer frame and the equipment module may be pivoted outwards beyond the lateral boundary of the vehicle, so that the equipment may simply be taken out by a fireman, and the fire service personnel do not impede each other upon removing the items of equipment. Thus, access is facilitated to the items of equipment stowed in the equipment modules.

Furthermore, it is possible for the shaft to be placed at an approximate distance from a side of the service vehicle which corresponds to a radius of the circle forming the cross-sectional shape of the equipment module. The radius preferably corresponds to half the distance between the two opposed sides, thereby assuring satisfactory access to the rotatably or pivotally mounted cylindrical equipment modules. Furthermore, the equipment modules may be closed by roll-top covers or the like which are installed in the sidewalls of the vehicle.

It is advantageous if a diameter of the circle forming the cross-sectional shape of the equipment module corresponds to say half the distance between the two opposed sides of the service vehicle, and two equipment modules are preferably placed side-by-side transversely of the direction of travel of the service vehicle, their central longitudinal axis being situated in a common plane extending at right angles to the direction of travel. Consequently, items of equipment may be taken out at both sides of the service vehicle by the personnel, independently of each other.

It is also possible to provide equipment modules having a dimension transversely to the direction of travel which is smaller than half the distance between the opposite sides of the service vehicle, and for a driving engine for the service vehicle to be situated between the two equipment modules. This allows each of the modules to be exposed at the two opposite sides and for the space between the modules to be used satisfactorily by accommodating the assemblies installed between them.

In accordance with the invention it is also possible for the equipment module to have a cross-section in the form of a circular segment and to be closed off by a cover plate in the area of a chord delimiting the circular segment and for shelf members of similar circular segment shaped form to be provided along a central longitudinal axis of the module. Because the equipment module is provided with a cover plate, it may be utilised for sealing off the inside of the vehicle during the travel of the vehicle, which obviates the need for additional hinged panels, doors or roller blinds.

In an advantageous arrangement, the central longitudinal axis is situated at an approximate distance from a side of the service vehicle which corresponds to the difference between the height of the arc and the radius of the circular segment forming the cross-sectional shape of the equipment module, whereby the lost internal volume of the vehicle is minimised. At the same

time, the construction of the equipment module in the form of a circular segment increases the area over which access may be gained to the stored equipment, the area being proportional to the arcuate periphery of the equipment modules, which is longer for example than the length of a sidewall measured in the longitudinal direction of the vehicle.

According to another embodiment of the invention, the equipment modules have a cross-section at right angles to their central longitudinal axis which corresponds to a circular segment whose arc height is greater than its radius, thereby securing more rapid access to the items of equipment since the opening of the equipment modules requires a lesser angle of pivotal displacement.

According to another embodiment of the invention, a carrying frame for the equipment modules is fastened on an extinguisher fluid tank which is self-supporting and is arranged approximately centrally with respect to the longitudinal axis of the vehicle and is fastened by resilient connecting means such as spring elements, to the chassis frame. Cylindrical recesses are provided in the sidewall of the extinguisher fluid tank which form a cylindrical segment whose radius is greater than the radius of the equipment module. This eliminates the construction of fastening points for the equipment modules on the chassis frame, and the suspension points of the equipment modules are identical with the extinguisher fluid tanks constructed in correspondingly identical manner. In the case of different vehicle chassis frames, only three fastening points of the extinguisher fluid tank need be adapted to the vehicle body construction according to directives of the vehicle chassis manufacturer, and it is possible to manage with minor construction tasks.

It is also possible to provide an equipment module provided in the driver's cab in the area behind the driver's seat, so that the inside of the driver's cab may also be re-equipped rapidly for carrying items of equipment.

According to another embodiment of the invention, the equipment modules and/or their carrying frame and/or an intermediate frame are vertically displaceable with respect to the vehicle, so that the manifold advantages of the standardised equipment modules may be simply adapted to different uses by providing even easier access. Furthermore, this vertical displacement may facilitate access to items of equipment, assemblies or the like, e.g. the driving engine, which are situated behind the equipment modules.

In an advantageous arrangement, the central longitudinal axis of the equipment modules may extend approximately parallel to the longitudinal axis of the vehicle, and the force of gravity may be used to assist the pivotal displacement by appropriate loading of the equipment modules.

Another advantageous embodiment of the invention provides that at least a part of a bearer frame of an equipment module is mounted in laterally and/or vertically displaceable manner on the chassis frame or on the extinguisher fluid tank, for example by a parallelogram linkage of levers, and that a remotely controlled displacement drive is installed therebetween. The use of a simple and light-weight mechanism will assure a gentle and smooth displacement of the equipment module with respect to the extinguisher fluid tank or the vehicle chassis.

In another advantageous embodiment, an equipment module is of parallelepipedal shape and is preferably

situated in a plane extending obliquely to the longitudinal axis of the vehicle and at right angles to the wheel support plane to provide room for opening a sliding door panel externally closing the equipment modules upon slight pivoting thereof. With this arrangement it is possible to open the equipment modules without projecting door components or without obstruction by the doors.

It is also possible for the equipment module to be pivotable with respect to the chassis frame around an axis extending in a plane at right angles to the wheel support plane and parallel to the direction of travel. The equipment modules in the region of the sides of the service vehicle may be swung away by pivoting the equipment modules around a vertical or horizontal axis, thus facilitating access to the equipment modules situated behind the former, or to a driving engine situated between equipment modules at opposite sides of the vehicle. In this connection, it is advantageous if the pivotal displacement is assisted by pivoting drives, for example hydraulic piston-cylinder device, rotary motors or by pneumatic springs biased in the opening direction.

In another advantageous arrangement, the horizontal axis of a module extending parallel to the direction of travel is situated inwardly of a side of the vehicle and spaced from the chassis frame, allowing the equipment module to be pivoted away in upward direction without requiring complex mechanisms.

In another advantageous arrangement, two equipment modules of parallelepipedal cross-section are pivotally mounted on a common vertical axis disposed adjacent a rear corner of the vehicle such that, in a closed condition, one of the modules extends along a side and the other along a rear of the vehicle about an engine compartment and, when pivoted outwardly from the vehicle, they expose the engine compartment at the end and side of the vehicle for access. As a result the parts of the chassis frame below the pivoted equipment modules may be utilised as a supporting surface for servicing the driving engine or the auxiliary assemblies situated thereat, with restricting the headroom of the service personnel.

Another embodiment of the invention provides an equipment module installed in a vertical guiding device of a pivoted frame, the frame being rotatably mounted on a pivot shaft supported in a carrying frame which is arranged for transverse displacement relative to the longitudinal axis of the vehicle. The equipment modules may thereby simply be withdrawn sideways and set down beside the vehicle, either to facilitate exchanging the equipment modules or for setting them down or picking them up.

In accordance with the invention, it is advantageous for an equipment module to be connected to a carrying frame by readily releasable connecting elements. This renders it possible to remove or insert or exchange equipment modules within a short period.

According to another aspect, the invention includes a service vehicle associated with a module repositioning system which comprises an equipment module magazine and conveyor for reception of several equipment modules, the equipment modules thereby being rapidly and simply exchangeable while the vehicles are in operation. For example, the service vehicles of a second operational group may thereby be re-equipped to comply with special requirements at the site of operation,

and it is unnecessary to keep a stock of special vehicles for particular cases of application.

Suitably, the module repositioning system is connected to a remote control device incorporating control elements disposed remote from the vehicle and the module repositioning system, for example at operational headquarters, so that the service vehicles may be simply equipped with the equipment modules of the corresponding method of operation during the period available between alerting the service personnel and the departure of the service vehicles.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described, by way of example, with reference to the accompanying partly diagrammatic drawings, in which:

FIG. 1 is a side elevation of a service vehicle according to the invention, with equipment modules mounted in the driver's cab and in an equipment compartment;

FIG. 2 is a side elevation of a service vehicle according to the invention, with equipment modules mounted in an equipment compartment;

FIG. 3 is a plan view, partly cut away, of the service vehicle of FIG. 2;

FIG. 4 is a perspective view of a side part of the equipment compartment of the vehicle of FIGS. 2 and 3, with equipment modules in different positions in a carrying frame;

FIG. 5 is a partly sectional end elevation of an equipment module mounted for lateral and vertical displacement in relation to a service vehicle chassis by means of a parallelogram linkage of levers;

FIG. 6 is a partly sectional end view of a service vehicle having equipment modules pivotally mounted on axes extending parallel to the longitudinal axis of the vehicle;

FIG. 7 is a fragmentary perspective view of part of the vehicle of FIG. 6, with an equipment module in a partially open condition;

FIG. 8 is a fragmentary plan view of part of a vehicle having equipment modules of generally parallelepipedal form and staggered obliquely in relation to the longitudinal axis of the vehicle, the modules comprising displaceable sliding doors;

FIG. 9 is a plan view of a service vehicle comprising equipment modules according to the invention and a module repositioning system;

FIG. 10 is a partly sectional side view of an equipment module having sealing arrangements and taken on line X—X of FIG. 11;

FIG. 11 is a fragmentary plan view of the equipment module of FIG. 10 and showing connecting elements between the module and a carrying frame;

FIG. 12 is a fragmentary plan view of another embodiment of a service vehicle according to the invention and carrying equipment modules, and

FIG. 13 is a diagrammatic end view of a service vehicle according to the invention and carrying equipment modules of a further construction and arrangement.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The service vehicle 1 of FIG. 1 is a fire service vehicle having a chassis frame 2 carried by wheels 3 on a wheel support surface 4, such as a road surface. The chassis frame 2 bears a driver's cab 5 and an equipment compartment 6. An equipment module 7 is installed in the driver's cab 5 behind forward seats, and further

equipment modules 8, 9 and 10 are situated in the equipment compartment 6. An extinguisher fluid pump 12 is disposed below the rearmost equipment module 10 on a part 11 of the chassis frame 2 which is displaced downwardly with respect to the chassis frame portion extending between the wheels, towards the wheel support surface 4. An extinguisher fluid tank 13 indicated in broken lines is disposed between the rows of equipment modules 8, 9 and 10 which are arranged along opposite sides of the vehicle 1.

The embodiment of FIG. 2 differs from that of FIG. 1 in that further seats 14 for personnel are installed behind the forward seats in the driver's cab in place of the equipment module 7. Like reference numerals are used in FIGS. 1 and 2 for like parts. FIG. 2 shows the equipment modules open, exposing implements 15, canisters 16 of extinguisher fluids, hoses 17 and hose fittings 18, stowed in compartments 8, 9 and 10. Below the equipment modules 8, 9 and beside the chassis frame 2 are disposed implement compartments 19 wherein, for example, there may be stowed a standby generator set 20 or other auxiliary drives for equipment, e.g. hydraulic systems or lifesaving, protective and rescue devices. It is equally possible to accommodate suction hoses for the extinguisher fluid pump 12 or for portable extinguisher fluid pumps in the section 19.

As apparent from FIG. 3, two rows of further seats 14 are provided in the driver's cab 5 behind the front seats 21 for the accommodation of support personnel.

The equipment modules 8, 9, 10, 22, 23, 24 are arranged in rows on opposite sides of the vehicle and each has a cylindrical casing 25 which may be turned about a central axis 26 extending substantially perpendicularly in relation to the wheel support surface 4. The cylindrical casings form a circular segment as seen in plan view, whose arc height 27 is greater than the radius 28. The casings are shown in their outward or unloading positions in FIG. 3, in which implements 15, extinguisher means 16, hoses 17 and hose fittings 18 are disposed laterally outwards of side walls 29, 30 of the equipment compartment 6 of the vehicle to facilitate access by service personnel from outside the vehicle. By pivotal displacement of the casings 25 of the modules 8 to 10 and 22 to 24 in either direction of rotation about the axes 26, as indicated by arrows 31, the arcuate segments of the casings 25 may be pivoted into complementary reception areas 32 within the vehicle. The reception areas 32 are suitably confined by complementary arcuate walls 33 of the extinguisher fluid tank 34 situated within the vehicle between the rows of modules 8-10 and 22-24.

As clearly seen in FIG. 4, the modules 8 to 10 are closed off at their flat sides by a cover plate 35 extending parallel to the axis 26 forming a pivot shaft. The arcuate side of the module houses three parallel shelf members 36 spaced vertically and extending normally from the plate 35. The pivot shafts 26 of the modules are journaled in bearings 37, above and below the modules, the bearings being supported in transverse members of a rectangular carrying frame 38 within which a row of modules 8-10 is mounted. For displacement of the modules about their axes 26, the pivot shafts have driving pinions 39 at their upper ends, as shown for the module 9, the pinions 39 cooperating with a driving rack 40 extending longitudinally of the row of modules and displaceably mounted on the frame 38 for reciprocation by a piston and cylinder device 41. By operation of the piston and cylinder device 41 to drive the rack 40, the



modules may be pivoted between an idle position in which the cover plates 35 are at the outside of the vehicle and the module shelves 36 are within the confines 32,33, and an operational position in which the shelves 36 extend outwardly of the vehicle sides, as shown in FIG. 3. It is also possible, as shown diagrammatically for module 8 in FIG. 3, to couple the pivot shafts 26 with a Vee pulley 42 and Vee belt 43 to a respective electric motor by a slip clutch so that the modules may be driven between stops 45, 46 delimiting the operational and idle positions of the modules. Detent means are suitably provided for securing the module at either of the two positions. For example, releasable hooks or pins 47 are suitably provided at the stops 45,46 for this purpose. Chain drives may equally well be used and suitably the Vee belt or chain drives are suitably coupled to means outside the vehicle for manual actuation by a hand wheel instead of by the motor. Means may be provided to assist the opening and/or closing actions, such as pneumatic springs or like accumulator devices.

Monitoring elements 48, such as electromagnetic proximity switches, are allocated to the stops 45,46 or to the securing means 47 so that the position of the modules may be monitored. The monitoring devices may be coupled to warning systems actuated when the vehicle drive is engaged to alert the driver if the modules are not appropriately positioned or secured.

It is to be understood that other driving devices and arrangements, or other securing means and stop arrangements may equally be used.

Suitably, the actuation of the driving devices and monitoring elements may be performed from the driver's cab; for example, from the driver's seat by the driver and also at other optional points particularly outside the vehicle by suitably positioned press-button switches or the like.

FIG. 5 shows a different embodiment of equipment modules 49,50 which are arranged to be laterally and/or vertically displaceable with respect to the chassis frame 2 of the fire service vehicle 1. To this end, the module 50 is installed by a parallelogram linkage of levers 51 in a carrying frame 52 of the vehicle body or equipment compartment containing an extinguisher fluid tank 54 supported on the chassis frame 2 by spring elements 53. Two parallel longer levers 55,56 of the linkage 51 at ends extending towards the chassis 2 are pivotally mounted on carrying frame 52 and at their other ends are pivotally secured to the equipment module 50. The module 50 is arranged to be displaced from an idle or stowed position shown in broken lines to a lowered or operational position shown in full lines by a piston and cylinder displacement drive 57 secured at one end to the tank 54 or on a frame member of the vehicle. The module 50 comprises a frame 58 to which the levers 55,56 are pivotally connected, and within which the module 50 is pivotally supported for movement about an upright axis 59 generally in the manner of the previous embodiment. As apparent from FIG. 5 at the left-hand side, a module may have cover plates which extend obliquely to the pivotal axis 59 and it will be appreciated that the sides may be of bent or curved configuration to assume an extension of the internal contour of the vehicle body when in the idle or stowed condition. This applies equally to the modules of the previous embodiments. As shown at the left-hand of FIG. 5, the hinged frame 58 or a carrying frame 60 may be extended beyond a side 29 of the vehicle into a laterally extended position shown in dash dotted lines by

means of a displacement drive 62 on a guiding column 61 whereby the equipment module 49 may be displaced laterally from the vehicle. The module 49, or the frame 58 thereof, is arranged to be lowered with respect to the carrying frame 60 by means of a vertical displacement drive 63 and suitable guide rails and rollers or telescoping guide devices to the lower position shown in full lines. In a similar manner, it is possible to arrange for displacement of the equipment module also longitudinally of the vehicle in a guiding device prior to lowering the module to the wheel support surface.

A further embodiment of equipment modules 64 is illustrated in FIGS. 6 and 7. The equipment modules 64 have a part cylindrical profile similar to the modules of the embodiment of FIGS. 3 and 4 and pivot shaft 65 is arranged parallel to the longitudinal direction of the vehicle—arrow 66. The equipment modules 64 may be pivoted in the direction of arrows 67 from an idle or stowed position shown by solid lines into an extended dispensing position shown by dash-dotted lines. The extinguisher fluid tank 68 of the fire service vehicle 1 is provided with correspondingly concavely arcuately curved sidewalls to receive equipment modules in the idle or stowed position. As more clearly apparent from the illustration in FIG. 7, the shelf members 69 having a generally rectangular form are mounted longitudinally in spaced parallel relationship to facilitate the stowage of implements or items of equipment, such as extinguisher means, hoses in hose fittings, therebetween. The equipment modules 64 are rotatably installed in a carrying frame 70 by means of the central shaft 65. It is also possible to install each equipment module 64 in its own intermediate frame which may be pivoted or displaced laterally and vertically with respect to the carrying frame or the chassis frame 2, and especially with respect to the extinguisher fluid tank 68. The equipment modules 64 and their shelf panels 69 may thereby be placed at an advantageous height with respect to the wheel support surface 4 for access by personnel. It is also possible, for example, as denoted by dash-dotted lines in the region of the right-hand equipment module in FIG. 6, to construct the equipment module 64 in parallelepipedal profile with an approximately rectangular cross-section. It is then advantageous for the carrying frame 70 to be movable out beyond the lateral delimitation 30 of the fire service vehicle 1 by the difference between half the height 71 and a width 72 of the module cross-section, so that the equipment module may then be pivoted around the central longitudinal axis 65.

It is also possible to turn equipment modules formed in this manner around axes extending at right angles to the wheel support surface 4, the lateral movement path of such equipment modules then corresponding to the difference between half the length of the equipment module in the longitudinal direction of the vehicle—arrow 73, FIG. 3—and the width 72 of the equipment module.

In the embodiment of FIG. 8, equipment modules 74 are set in a row obliquely in the direction of travel denoted by the arrow 73 and in the sides of the fire service vehicle 1. Sliding door elements 75 are provided for closing the outsides of the equipment modules 74. Thanks to the diagonally aligned arrangement of the equipment modules 74, the sliding door elements 75 may in each case be slid behind the rear longer side of an adjacent equipment module 74 following in the direction of travel, thereby allowing unrestricted access to the outsides of the equipment modules 74.

According to a modification of this embodiment, it is possible to use triangular pivotable equipment module elements 76 for closure of the equipment modules 74, which may be pivoted around a pivot shaft 77 mounted vertically at an apex of the triangular element at an outermost corner of an adjacent module 74, for opening the equipment modules 74 either manually, mechanically or fully automatically, from the position shown by solid lines—closing the forward equipment module 74—into the opened position shown by dash-dotted lines.

FIG. 9 shows a repositioning system 78 for equipment modules 7 to 10 and 22 to 24. This repositioning system 78 serves the purpose of loading fire service vehicles 1 with equipment modules 7 to 10 and 22 to 24, such as have been described with reference to FIGS. 1 to 3. To this end, it is possible to provide the vehicle with equipment adequate for the major part of possible uses. If, on the contrary, special conditions at the site of operation are known in advance or from observation of service personnel first to reach the site of operation, it is possible to install equipment modules 79, 80, 81 in the fire service vehicle 1 instead of the standard equipment modules. For example, these may be equipped with special outfits for use during earthquakes, requirements for heavy foam application, rescue on waterways, application to oil, antiradiation application, or the like. The different equipment modules 7 to 10, 22 to 24, 49, 50, 79 to 81 may for example be suspended from a circulating chain conveyor 82 which forms a magazine for a range of different equipment modules 7 to 10, 22 to 24, 79 to 81. A crane system 83 displaceable in the longitudinal and transverse directions in relation to the vehicle is arranged so that equipment modules may be extracted from the fire service vehicle 1 and suspended on the chain 82. In the same way, the required equipment modules are taken from the chain 82 and secured in the fire service vehicle 1. This repositioning of the equipment modules may be performed semi-automatically under manual control or fully automatically. Control units 84 may be provided in the region of the crane system 83 for this purpose.

It is also possible to install corresponding control units 85 at operational headquarters so that, upon receipt of an operational order, the equipment of the fire service vehicle may be preselected in accordance with the operation conditions described and the required equipment modules may be inserted into the fire service vehicle fully automatically by the crane system 83 and the repositioning system 78. Suitably the repositioning system 78 is so arranged to that the selection and loading of the equipment modules from the chain conveyor into the vehicle can be effected within the period normally required by service personnel to reach the fire service vehicles 1 so that the departure is not or only insignificantly delayed. The disadvantage caused by any slight delay in the departure is frequently obviated by the fact that the fire service vehicle 1 will be provided with the necessary items of equipment for dealing with the conditions of operations.

To allow for rapid and fully automatic selection of the equipment modules 7 to 10, 22 to 24, 79 to 81 provided with the appropriate equipment, the modules are suitably marked by code carriers 86 so that a rapid selection of the desired equipment modules may be performed in the region of the repositioning system 78. It is also possible to construct not only the equipment modules but also particular individual parts of the

equipment in exchangeable manner and mark them with corresponding code carriers 86, so that only specific equipment items matching the different requirements may be exchanged or loaded into a module. It is to be understood that it is possible in the repositioning system described, to utilise parallelepipedal equipment modules 128—as shown by dash-dotted lines—instead of the equipment modules 79 and 80 having a cross-section in the form of a circular segment.

Referring now to FIGS. 10 and 11, an equipment module 7 has a pivot shaft 87 which is journaled in two spaced bearer units 88. The bearer units 88 are coated with anti-friction facings 89. A cover plate 91 is secured by brackets 90 on the pivot shaft 87. Half shells 92 holding the pivot shaft 87 on the side distal from the cover plate 91 are welded to the pivot shaft 87, and are connected by bolts 93 and nuts 94 to brackets 90 extending on the opposite side of the pivot shaft. The spacing of the cover plate 91 from the pivot shaft 87 may be adjusted in the region of these joints between the brackets 90 and the half-shells 92 by the bolts 93 and nuts 94 and appropriate intermediate layers of packing shims or the like.

The bearer units 88 are secured in an intermediate frame 95 and the space between the intermediate frame 95 and the cover plate 91 is closed by sealing elements 96. These sealing elements 96 have a box section 97 which is secured by a gripping section 98 integrally formed therewith on a holder 99 projecting from the intermediate frame 95. To prevent the sealing element 96 from being pulled off the holder 99 upon opening the equipment module 7, a protective angle section 100 is provided. The intermediate frame 95 is equipped with projections directed against a carrying frame 101 and sealing elements 102 are similarly provided between the carrying frame 101 and the intermediate frame 95.

Tapered bores 103 are suitably provided in the intermediate frame 95 for locking the intermediate frame 95 in the carrying frame 101.

As shown in FIG. 11, displacing drives 104 are installed on the carrying frame 101, whereby locking studs 105—which may equally be of tapered form for better location and centering—are arranged for insertion into the bores 103. It is possible by actuating the displacing drives 104, which may be pneumatically operated piston-cylinder systems, to place the locking studs 105 into and out of engagement with the intermediate frame 95 and thus with the equipment module 7. These connecting elements 106 formed by the displacing drives 104, the locking studs 105 and the bores 103, allow for rapid interchange of the equipment modules 7, for example by means of a module repositioning system 78 depicted in FIG. 9.

It is also apparent from FIG. 11 that—instead of the connecting elements 106—the fastening of the bearer units 88 to the carrying frame may be rigid, for example by bolted connections with interposed resilient elements.

In the fragmentary plan view of FIG. 12, a driving engine 107 is situated approximately at the longitudinal centre line in the stern section of the vehicle. The driving engine is preceded by an equipment module 108 which is mounted for rotation about a vertical axis 109 and has a circular cross-section. A radius 110 of the equipment module 109 amounts to approximately half a distance 111 between the opposite sides 112, 113 of the fire service vehicle 1. Access to the equipment module

108 is provided via "roll-top" panels 114 situated in the sidewalls of the fire service vehicle 1.

Approximately parallelepipedal equipment modules 115 to 117 are situated between the equipment module 108 and the stern of the fire service vehicle 1, between the vehicle sides 112 and 113 and the driving engine 107. The equipment module 115 is mounted for outward pivotal movement from the position shown by solid lines into the position shown by pecked lines about a pivotal axis 118 in the rear outer corner section of the equipment module 115. So that an optimum unobstructed access is possible to the driving engine 107 or any other system situated between these equipment modules, such as an emergency generator set, an extinguisher fluid pump, a tank or the like, an equipment module 116 extending parallel to the rear end side of the fire service vehicle is similarly arranged to be outwardly pivoted around a vertical axis 119 at an outer corner thereof and this vertical pivot axis 119 may also carry the equipment module 117. As a result access to the driving engine 107 is rendered possible from all sides without obstruction by outwardly pivoting the equipment modules 115 to 117 through 90°. The frame members of the chassis frame, which are situated under the equipment modules 115 to 117 may then be utilised as supporting or working surfaces for the service personnel. As shown diagrammatically in the case of the equipment module 116, this outward pivotal displacement of the equipment modules 115 to 117 may be assisted or caused by means of a piston-cylinder system 120. Suitably appropriate arrestor means, for immobilising the equipment modules 115 to 117 in their stowed and open positions are provided. To this end, use may be made of any optional securing devices such as locking bolts or pneumatically or hydraulically operated locking cylinders or the like.

In the embodiment of FIG. 13, equipment modules 121 and 122 are situated between sides 112 and 113 of the fire service vehicle 1 and a driving engine 107 is situated approximately at the centre line of the vehicle. To allow for access to the driving engine 107 or to an equipment module 123 installed in its stead or forwardly thereof—as shown by dash-dotted lines—the equipment module 121 is arranged to be pivoted away in lateral and upward direction around an upper horizontal axis 124.

Another means for allowing access to the driving engine 107 or the equipment module 123 is illustrated at the side 113 of the fire service vehicle 1 where an equipment module 122 is upwardly displaced at right angles to the wheel support surface 4, for example by means of a piston-cylinder drive 125.

It is possible within the scope of the invention for the arrestor devices for the individual displaceable equipment modules as well as the displacing drives to be operated manually, semi-automatically or fully automatically. It is also possible to utilise the displaceability of the equipment modules for improved access to equipment elements or assemblies or the like arranged therebetween, to facilitate the removal thereof.

It is also possible to arrange—as shown in FIG. 12 in the area of the equipment module 108 in diagrammatical form by pecked lines—two adjacent upright cylindrical rotatable modules 126 and 127 with their axes situated vertically in a plane extending at right angles to the direction of travel. To this end, a radius of the equipment modules 126 and 127 corresponds approximately to a quarter of the distance 111 between the two sides of the vehicle, or to half of the radius 110.

Whilst the invention and many of its attendant advantages will be understood from the foregoing description

it will be apparent that various changes can be made in the construction and arrangement of parts described without departing from the spirit and scope of the invention or sacrificing all of its material advantages.

What is claimed is:

1. A service vehicle comprising
  - (a) a chassis frame carried by wheels for support on a surface,
  - (b) a driver's cab mounted on the chassis frame,
  - (c) two side walls mounted on the chassis frame and defining an equipment compartment comprising
    - (1) at least one equipment module arranged along each one of the side walls and holding service equipment, and
  - (d) means for pivoting each one of the equipment modules about a respective axis arranged at the side wall along which the equipment module is arranged between a first position wherein the equipment module is located substantially within the equipment compartment and the service equipment is inaccessible from the outside and a second position wherein the equipment module is located substantially outside the equipment compartment and the service equipment is accessible from the outside; and
  - (e) a complementary structure within the equipment compartment and including recesses mating with the modules in the first position to confine the service equipment.
2. The service vehicle of claim 1, wherein each one of the pivoting axes extends substantially perpendicularly to the support surface.
3. The service vehicle of claim 2, wherein a horizontal cross section of the equipment modules has the shape of a segment of a circle delimited by a chord and the segment has an arc height exceeding the radius of the circle.
4. The service vehicle of claim 3, wherein the pivoting means comprises a pivot shaft for each one of the equipment modules, a plurality of said equipment modules being arranged at each side wall and the axes of the pivot shafts at each side wall extending in a common plane.
5. The service vehicle of claim 3, further comprising a cover plate extending along the chord and closing each equipment module, and a plurality of shelf members spaced along the axis of each equipment module, the shelf members having the same shape as the cross sections of the equipment modules.
6. The service vehicle of claim 3, wherein the axes of the equipment modules at each side wall are spaced from said side wall a distance corresponding to the difference between the height of the arc of the circular segment and half the diameter.
7. The service vehicle of claim 3, further comprising a carrier frame carrying each pivot axis at each side wall.
8. The service vehicle of claim 7, wherein said complementary structure is a fire extinguisher fluid tank mounted centrally between the side walls, and the tank having side walls facing the equipment modules, the tank side walls defining said recesses of a cross section having the shape of a circular segment, the radius of the circular segment of the recess cross sections exceeding that of the circular segment of the equipment module cross sections.
9. The service vehicle of claim 1, further comprising a driver's seat in the driver's cab and an additional equipment module mounted in the driver's cab behind the driver's seat.

\* \* \* \* \*

**RELATED PROCEEDINGS APPENDIX**

None.